

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow. After amending the claims as set forth above, claims 8-11 and 12-20 are now pending in this application.

Rejection of claims 8-12 based on Koganezawa

Claims 8-11 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,489,409 (“Koganezawa”). Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koganezawa in view of U.S. Patent 5,447,670 (“Ito”). For at least the following reasons, these rejections are traversed.

Claim 8 (as amended) recites a die having a branch part arranged upstream of the first and second openings inside the die which divides the die into a first passage and a second passage, and a valve mechanism arranged in the second passage, wherein the valve mechanism adjusts a flow rate of the second passage, and being arranged to fully close the second passage when the second opening is fully closed and the step of “opening and closing the valve mechanism within a width of the second passage to control an amount of the material to be supplied to the first and second passages.” Koganezawa does not teach or suggest this combination of features. Indeed, the PTO has conceded that Koganezawa does not teach or suggest the opening and closing of a valve mechanism to control material flow. (See page 3 of the Office Action.) Accordingly, claim 8 is not anticipated by Koganezawa.

In the rejection of (now canceled) claim 12, the PTO asserts that Ito teaches the steps of opening and closing a valve mechanism to control material flow, and it would have been obvious to open and close a valve mechanism to control material flow because Ito “suggests that this is an equivalent and alternative means of supplying material to a region that changes shape and also has a thickened portion.” (Page 3 of the Office Action.)

In the method of claim 8, when the second opening is fully closed, the valve mechanism closes the second passage, and the resin does not flow through the second passage. Even in this case, the resin flows through the first passage, and the gear pump is not stopped. Accordingly, it is possible to prevent the degradation of resin, unstable control, and galling of the gears. (See paragraphs 0024 and 0040 of the specification.)

In contrast, Ito does not teach or suggest a valve mechanism arranged to fully close a passage when an opening is fully closed. In particular, Ito discloses that the third and fourth

flow passages 42 and 43 are always opened to the opening 10 of the main die plate 6. The second flow passage 41, the third flow passage 42, and the fourth flow passage 43 of Ito mainly form the lip portion 4 of the weather strip 2. The movable orifice plate 38 is slidable in the direction of the width of the lip 4 so that the width of the lip portion 4 of the weather strip 2 is varied. In effect, the third and fourth flow passages 42 and 43 are opened and lead through the opening 10 to the opening with a variable shape defined by the fixed orifice plate 7 and the movable orifice plate 38. (See Fig. 20 of Ito.) However, the opening formed by the fixed and movable orifice plates cannot fully close, and the passage 43 does not fully close. Thus, Ito does not teach or suggest a valve mechanism arranged to fully close a second passage when the second opening is fully closed. Accordingly, Ito does not cure the deficiencies of Koganezawa. Therefore, claim 8 is not rendered unpatentable over any combination of Koganezawa and Ito.

In addition, there is no motivation to combine the teachings of Koganezawa and Ito. The unvulcanized rubber of Ito and the thermoplastic resin of Koganezawa are non-Newtonian fluid having viscoelasticity, and accordingly their pressure is not evenly transmitted in their respective systems, unlike a hydraulic system using Pascal's principle. The unvulcanized rubber and the thermoplastic resin have compressibility to vary their volume by the increasing and decreasing of the pressure, as understood from their P-V-T characteristics (pressure, volume and temperature). However, in the case of Ito, the volume of the flow passage of the die is continuously varied by the stroke of the piston 45, and accordingly the variation in the pressure is extremely large in portions of the flow passage. Thus, the pressure is not stabilized, causing various adverse effects.

For example, in the process of filling the material within the cylinder 44, the piston 45 is lowered, and the volume of the cylinder 44 is increased. As a result, the pressure within the cylinder 44 is decreased, and the filled material is expanded. In the process of discharging the material, the piston 45 is raised, and the volume of the cylinder 44 is decreased. Accordingly, the pressure within the cylinder is increased, and the filled material is contracted. Because the variation of the volume of the cylinder 44 is partially displaced by the variation of the volume of the material and by the variation of the pressure, the entire variation of the volume of the cylinder is not effectively reflected in the variation of the discharge amount, and the accuracy of the discharge amount is diminished.

Moreover, the quantity flowing from the flow passage 41 to the flow passage 43 is largely affected by the pressure within the cylinder 44. That is, the inflow of material is decreased when the pressure within the cylinder 44 is increased, and the inflow is increased when the pressure is decreased. In a case in which the volume of the cylinder 44 is continuously varied as in Ito, the ratio of the distribution of material to the flow passage 42 and the flow passage 43 cannot be constant. A constant quantity of material is then not supplied to the opening in the fixed and movable orifice plates, and a problem occurs in which the extruded part has a varied sectional shape instead of a constant one (i.e., a corrugated shape is caused by the surging).

Furthermore, when the piston 45 of Ito is lowered, the material inflowing from the flow passage 43 is distributed into the passage connected with the cylinder 44 and the die plate 6. This ratio of the distribution is affected by the back pressure applied from the various portions, and the variation of the quantity discharged to the fixed and movable orifice plates is affected with the variation of the volume and pressure. Thus, it is not possible to achieve sufficiently accurate results because of the variation in the quantity discharged. On the other hand, when the piston 45 is raised, all of the material extruded from the cylinder 44 is not supplied to the flow passage connected with the die plate 6 because the pressure is also transmitted to the flow passage 43 on the inflow side. Accordingly, there are problems with reverse flow or reduction of the inflow from the flow passage 41 to the flow passage 43 by the back pressure applied from the cylinder side. Thus, it is difficult to achieve sufficiently accurate results. With these consequences of the movement of the piston 45, the appropriate quantity of material to the area of the opening formed by the fixed and movable orifice plates is not ensured. Therefore, the resulting shape is not the desired shape, but can become a corrugated shape caused by the surging. With all these design issues, one with ordinary skill in the art would not be motivated to combine the teachings of Ito with the teachings of Koganezawa.

Using the method of claim 8, it is possible to directly reflect the supply quantity from the gear pump to the quantity extruded from the die, without the time lag. Also, the only necessary quantity of material is supplied by the gear pump with high accuracy. Accordingly, it is possible to achieve the extrusion molding with high accuracy and with high responsiveness to the discharge quantity. It is also possible to extensively improve the quality of the appearance of the molding component having a variable shape.

Claims 9-11 depend from and contain all the features of claim 8, and are allowable therewith for at least the same reasons as claim 8, without regard to the further patentable features contained therein.

For at least these reasons, favorable reconsideration of the rejections is respectfully requested.

Allowability of claims 13-20

Claim 13 recites "a second gear pump arranged between the die and the extruder, the second gear pump being connected in series to the first gear pump, a main passage which connects the first and second gear pumps, the main passage being connected to the first opening of the die, and a bypass passage connected to the main passage between the first and second gear pumps, the bypass passage being connected to the second opening of the die." None of Koganezawa, Ito, or a combination thereof teaches or suggests this combination of features. Claims 14-17 depend from and contain all the features of claim 13, and are allowable therewith for at least the same reasons as claim 13, without regard to the further patentable features contained therein.

Claims 18-20 depend from and contain all the features of claim 8, and are allowable therewith for at least the same reasons as claim 8, without regard to the further patentable features contained therein.

For at least these reasons, allowance of these claims is respectfully requested.

Conclusion

Applicant believes that the present application is now in condition for allowance. Favorable reconsideration of the application as amended is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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